CLAIMS

1. A method for improving the signal-to-noise ratio (S/N) in a system for measuring flatness of a strip (1) of rolled material, said system comprising at least one signal processor (60) for determining said flatness and a measuring roll (2, 52), having a number of measuring devices for force/pressure registration, each said device generating a measurement output signals (U_{pi}) depending on the contact between the strip (1) and the measuring roll (2, 52), wherein each measurement signal (U_{pi}) comprises a force component signal (U_{Fi}) and a noise signal component, said method comprising the step of:

- generating measurement output signals (Up,) by means of each measuring device depending on the contact between the strip (1)) and the measuring roll (2);

characterized in that, said method comprises the following steps:

- determining a time length (T_{tot}), based on the measurement output signals (U_{pi});
- generating a time slot having the determined time length (T_{tot}) ;
- synchronizing said time slot to the appearance of a force component (U_{Fi}) on an input of at least one quantity processor (62) of said signal processor (60);
- controlling at least one quantity processor (62) to be open for registration of an incoming force component signal (U_{Fi}) during said time slot and be closed until the next successive time slot appears.

2. A method according to claim 1, characterized in that, said method comprises the steps:

- generating a mean value signal (U_A) using the force component signals (U_{Fi}), which are generated within a time interval (T_ε), from all or a number of the measurement output signals (U_{pi});
- determining a time length (T_{tot}), based on the mean value signal (U_A).

3. A method according to claim 2, characterized in that, said method comprises the steps:

- adding a number n, n is a positive integer, of measurement output signals(U_{Pi}) generated within a small time period (T_ε) to a mean value determining circuit (63) comprising at least one summation circuit (73) for producing a summation signal (U_S);

- connecting said summation signal (Us) to a dividing circuit (77) for dividing (Us) with an integer n, where n equals the number of added signals (U_{pi}) to the summation circuit (73) ;

- producing a mean value signal (U_A) by said dividing circuit (77).

4. A method according to claim 2, characterized in that, said method comprises the step:

- adding a number n, n is a positive integer, of measurement output signals (U_{pi}) generated within a time period (T_ε) to the mean value determining circuit (63) comprising a microprocessor and applied software, stored in a memory that is connected to said microprocessor, wherein the software is adapted for calculating a mean value from a number of measurement output signals (U_{pi}).

5. A method according to claim 3 or 4, characterized in that, said method comprises the step:

- storing and adding, to at least one second summation circuit (81), a number k, k is a positive integer, of consecutive mean value signals (U_A) to each other for further improvement of the S/N ratio.

6. A method according to claim 5, characterized in that, the method comprises the step:

- signal treating of the mean value signal (U_A) by means of filtering and/or demodulating and/or rectifying the mean value (U_A) .

7. A device (145) for improving the signal-to-noise ratio (S/N) in a system for measuring flatness of a strip (1) of rolled material, said system comprising at least one signal processor (60) for determining said flatness and a measuring roll (2), having a number of measuring devices for force/pressure registration, each said device generating a measurement output signals (U_{pi}) depending on the contact between the strip and the measuring roll, wherein said measurement output signal (U_{pi}) comprises a force component signal (U_{Fi}) and a noise signal component, characterized in that the device (145) comprises a position synchronization processor (144) that is arranged for determining a time length (T_{tot}) based on the measurement output signals (U_{Pi}), for generating a time slot having the determined time length (T_{tot}), for synchronizing said time slot to the appearance of a force component signal (U_{Fi}) on an input of at least one quantity processor (62) of said signal processor (60) and for controlling at least one quantity processor (62) to be open for registration of a incoming force component signals

(U_{Fi}) during said time slot and be closed until the next successive time slot appears.

8. A device according to claim 7, characterized in that, said device (145) comprises a mean value determining circuit (63) generating a mean value signal (U_A) to the position synchronisation processor (144) using the force component signals (U_{Fi}), which are generated within a time interval (Tε), from all or a number of said measurement output signals (U_{Pi}) .

9. A device according to claim 8, characterized in that, said mean value determining circuit (63) comprises at least one summation circuit (73) for adding a number n, n is an positive integer, of measurement output signals (U_{Pi}) generated within said time period (Tε), said summation circuit (73) producing a summation signal (U_s), which is connected to a dividing circuit (77) for dividing (U_s) with an integer n, where n equals the number of added signals (U_{Pi}) to the summation circuit (73), said dividing circuit (77) producing a mean value signal (U_A).

10. A device according to claim 8, characterized in that, said mean value determining circuit (63) comprises a microprocessor and applied software, stored in a memory connected to said microprocessor, the software adapted for calculating a mean value from a number of signals (U_{pi}).

11. A device according to claim 9 or 10, characterized in that, said device (145) comprises at least one second summation circuit (81) for storing and adding a number k, k is a positive integer, of consecutive mean value signals (U_A) to each other for further improvement of the S/N ratio.

12. A device according to claim 11, characterized in that, the device (145) comprises a signal treatment device (58) comprising at least one filter device or at least one demodulating device or at least one rectifying device for signal treatment of the mean value signal (U_A).

13. A device according to any of the claims 9-12, characterized in that, connecting said mean value signal (U_A) to the position synchronisation processor (144) for determining the wrap angle (a) which is used in the system (40) for determining the flatness.

14. The use of a device (145) according to any of the claims 7 to 13 in a rolling mill.

15. A computer program product containing computer program code elements or software routines that when run on a computer or processor causes said computer or processor to carry out the steps of claims 1-6.

16. A flatness determination signal for improving the signal to-noise ratio (S/N) in a system for measuring flatness of a strip (1) of rolled material and derived from at least one measurement signal (U_{pi}), characterized in that each separate measurement signal (U_{pi}) is generated by a corresponding measuring device of all measuring devices belonging to at least one of all measurement zones of a measuring roll and comprises one or more measurable values for calculating at least one of following quantities or vectors: strip tension vector **T**, wrap angel α, distributed force vector $\mathbf{F}_2$, force vector $\mathbf{F}_{mi}$, flatness vector $\Delta\sigma 1$ [N/mm^2] and/or a corresponding quantity flatness vector $\Delta\sigma_2$ [I-unit].

17. A flatness determination signal according to claim 16, characterized in that said flatness determination signal is input signal to a flatness determination unit for calculating at least one of said quantities or vectors.

18. A flatness determination signal according to claim 17, characterized in that said flatness determination signal comprises a force component signal (U_{Fi}).

19. A flatness determination signal according to claim 18, characterized in that said force component signal (U_{Fi}) includes a train of electrical pulses.

20. A flatness determination signal according to any of claims 16-19, in that a number of said separate measurement signal (U_{pi}), each including a train of electrical pulses, are synchronized and combined to a flatness determination signal for calculating at least one of said quantities or vectors.

21. A system for measuring flatness of a strip (1) of rolled material, said system

comprises at least one signal processor (60) for determining said flatness and a measuring roll (2), having a number of measuring devices for force/pressure registration, said devices generating measurement output signals (U_{pl}) depending on the contact between the strip and the measuring roll, wherein said measurement output signal (U_{pl}) comprises a force component signal (U_{Fl}) and a noise signal component, characterized in the system comprises a device (145) for improving the signal-to-noise ratio (S/N), wherein said device (145) comprises a position synchronisation processor (144) that is arranged for determining a time length (T_{tot}) based on the measurement output signals (U_{Pl}), for generating a time slot having the determined time length (T_{tot}), for synchronising said time slot to the appearance of a force component signal (U_{Fl}) on an input of at least one quantity processor (62) of said signal processor (60) and for controlling at least one quantity processor (62) to be open for registration of a incoming force component signals (U_{Fl}) during said time slot and be closed until the next successive time slot appears.

22. A system according to claim 21, characterized in that, said device (145) comprises a mean value determining circuit (63) generating a mean value signal (U_A) to the position synchronisation processor (144) using the force component signals (U_{Fl}), which are generated within a time interval ($T\varepsilon$), from all or a number of said measurement output signals (U_{pl}) .

23. A system according to claim 22, characterized in that, said mean value determining circuit (63) comprises at least one summation circuit (73) for adding a number n, n is an positive integer, of measurement output signals (U_{Pl}) generated within said time period ($T\varepsilon$), said summation circuit (73) producing a summation signal (Us), which is connected to a dividing circuit (77) for dividing (Us) with an integer n, where n equals the number of added signals (U_{Pl}) to the summation circuit (73), said dividing circuit (77) producing a mean value signal (U_A).

24. A system according to claim 22, characterized in that, said mean value determining circuit (63) comprises a microprocessor and applied software, stored in a memory connected to said microprocessor, the software adapted for calculating a mean value from a number of signals (U_{pl}).

25. A system according to claim 23 or 24, characterized in that, said device (145) comprises at least one second summation circuit (81) for storing and adding a number k, k is a positive integer, of consecutive mean value signals (U_A) to each other for further improvement of the S/N ratio.

26. A system according to claim 21, characterized in that, the device (145) comprises a signal treatment device (58) comprising at least one filter device or at least one demodulating device or at least one rectifying device for signal treatment of the mean value signal (U_A).

27. A system according to any of the claims 21-26, in that, connecting said mean value signal (U_A) to the position synchronisation processor (144) for determining the wrap angle (α), which is used in the system (40) for determining the flatness.